

New view on project and investment management in a more agile IT and agile Business environment

Dr. Frank Stumpe

Frank.Stumpe@kbc.be

Head Competence Centre

Project Based Working

Group KBC

Havenlaan 2

1020 Brussels

Belgium

Keywords: project management, agile, system-cybernetic, case study

Abstract: Historical view on project based working and the new trends in IT shows that there is a need of new steering and management of investments. The gap between the agility of the market with its customers and the way of managing projects increases continuously. Using a cybernetic model to steer this complex system allows to get more insights and to adopt the way of project management.

Traditional steering based on Scope, Timing, Resources and Quality is not sufficient anymore. User integration, value commitment and delivery of customer's expected out-come in an agile B2B and B2C environment allows to create value as early as possible. Market entry is prioritising. With a case-study in the financial industry for fundraising and grand management an agile business combined with an agile IT shows that significant savings in time and budget are possible and a value creation can be ensured early.

1. Historical view on projects and investments in IT

Managing an IT-organization in the context of project based working is not an end in itself. It is always a supporting activity to allow processing and to deliver value to the customer. Thus there is a well-defined link between management on the one hand, and processing and delivery, on the other. Investments are also aimed to deliver added value thus they are linked to management. This link is the well-known link of project management.

Just before the Industrial Revolution the customer needs were served by small independent service providers and self-care. Any investment was done generations before and continuously improved and maintained. We can define this as business model BUS.0.0. which delivers services to a customer CUS.0.0. Within the business model BUS.0.0 the investment model was INV.0.0. A balance was present.

The causes of the Industrial Revolution remain a topic for debate. However, recent research into history of Marketing ii has challenged the traditional, supply-oriented interpretation of the Industrial Revolution and pointed out that the changed needs are more the cause of change than assumed so far. This means that the needs of the customers changed towards CUS.1.0.: More needs to be fulfilled for lower prices. As the customer model changed the business model had to follow. The Industrial Revolution was the transition to new manufacturing processes to fulfil the new customer needs. Thus the business model BUS.1.0 was created and implemented. In this business model investment was seen as the same as processing and delivering of value. The Industrial revolution was characterized by growth and profit increase which was the base for the merger of management (investment as well as processing and delivery). By that the investment model stays on INV.0.0.

During the 1940s the military needs requested a more structured approach for investment management. As the Second World War was requesting a huge amount of military equipment the needs of the customer changed towards CUS.2.0. The available business model BUS.1.0 was no longer valid and on top of this, the investment management INV.0.0 even less useful. Business followed the new customer and faced the distance between BUS.2.0 and INV.0.0. Thus BUS.2.0 has to change the investment model in order to be able to deliver the expected

value. The first steps towards investment management were done within the INV.1.0 model. In the American military industry (e.g. development the B52s) the line managers are also executing the function of investment manager. This mix leads to a “over-the-fence management”: Once the responsibility is executed the results are thrown “over the fence” with the hope that some will pick it up. Within the next 20 years best practices are identified and shared. The first steps were done towards splitting of processing and delivery on the one hand, and investment management on the other hand.ⁱⁱⁱ

The first real investment model was created by the American military governance to allow investment steering during the Second World War. The aim was to take care about the timing of delivery (military equipment was necessary to be delivered on time) and the costs (there was a certain amount of equipment to be delivered despite limited resources). The target system Scope (S), Timing (T), Resources (R) and Quality (Q) was created.

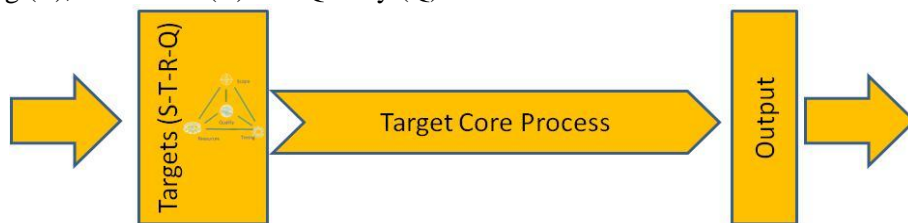


Figure 1: Basic Investment Management on Scope, Timing, Resources and Quality

From that moment onwards, the link between management, processing and delivery, and investment has continued to grow. As the needs of the customers are changing towards more stable spending and value delivery (CUS.3.0) the business models are trying to follow suit with a model BUS.2.5, but somewhat delayed. This delay was accepted and even reinforced. The investment model has not been able to follow and stayed behind on INV.1.5.

Let us consider Moore's law^{iv}: The change on the computer market grows exponentially. Modern researchers as Ray Kurzweil^v believe that the exponential improvement described by Moore's law will ultimately lead to a technological singularity: a period where progress in technology occurs almost instantly. The same trends can be found in other industries^{vi}. As the technology changes the customer follows these trends and develops toward more modern customer models CUS.4.0 or even CUS.5.0. The business is not able to follow and stays on BUS 3.0 and the investment model even follows later with INV.2.0. As we look on modern investment management methods like PRINCE2^{vii} or COBIT 5.0^{viii}, they are dealing with business investments enabled by (IT) technology but they all focus on the one-dimensional investment management.

2. Challenges of today's project and investment management

Otto Scharmer^{ix} mentioned that there is a need to leave the old ways of management behind. This old principle was to focus on “silos” in order to describe business structures as it is traditionally done with the “over-the-fence management”. He believes that this management has led to the modern crisis. This one-dimensional investment model must be overcome inside as well as outside the business units.

The framework for modern investment management is based on two main ideas. The first assumes four stages in the evolution of Western capitalism. It refers to the history of investment management as described above:

- Capitalism 0.0: the first industrialization. Investments are managed by the line in a hierarchical way (focus on delivery of goods). The classical separation of operations and investments dried out.
- Capitalism 1.0: the free-market or laissez-faire capitalism (focus on growth).
- Capitalism 2.0: a more regulated European-style stakeholder capitalism (focus on redistribution)

- Capitalism 3.0: an (as-yet unrealized) intentional, inclusive, ecosystem economy that upgrades the capacity for collaboration and innovation throughout all sectors of society (focus on ecosystem innovation).

The investment management method changed in parallel during the time described herex but with a slower speed. But still today the motivation is to manage investments based on finance-driven KPIs (Key Performance Indicators), the challenges of the generation (X).0, however, are not manageable with methods of the generation (X-1).0. Thus the new generation (X+1).0 is necessary to be prepared today for the future because – as Osterwalder & Pigneur have argued - “today’s models are most likely to be outdated tomorrow”^{xi}.

The second idea is based on the fact that inter-technology thinking will not allow to successfully deliver any investment. Therefore modern management methods need transversal and cross-technology methods with clear future-oriented targets and visions. Here the system of cybernetics can help to model investment management in a new way that may be able to solve the challenges of the capitalism 4.0^{xii}.

Beside the rapid changes of the economical environment, information technology is even changing more rapidly. One example is the usage of IT. 40% of the devices used to access business applications are personally owned by iWorkers, it went up to this figure from 30% in 2010^{xiii}. Managing technological change like computerisation of IT requires a combination of people, organization and this technology to ensure that these new technologies are used safely, securely and efficiently and to effectively manage the changes being rolled out to the customers.^{xiv}

Today, IT systems often enforce some human mechanization, which may have reinforced the sense among employees that they should be saying NO to certain new devices of IT —a perception which a project manager may need to take into account.^{xv}

Other trends are the battle of mobile devices, Internet of Things, hybrid IT systems and integrated eco systems.^{xvi} It looks as if by 2013, mobile phones will have overtaken PCs as the most common Web access device worldwide and that by 2015, over 80 percent of the handsets sold in mature markets will be Smartphone.^{xvii} The Internet of Things (IoT) is a concept that describes how the Internet will expand because physical items such as consumer devices and physical assets are going to be connected to the Internet. Key elements of the IoT which are being embedded in a variety of mobile devices, include embedded sensors, image recognition technologies and NFC used for payment and other transactions^{xviii}.

Hybrid IT systems are the answer on the request to do more with less. This view challenges IT departments to play multiple roles in coordinating IT-related activities, and cloud computing is now pushing that change to an even higher level. This also will have impact on project management in IT.^{xix}

The market is undergoing a shift toward more integrated systems and ecosystems. Thus it is moving away from loosely-coupled heterogeneous approaches. This trend is driven by the users’ desire for lower costs, simplicity, and more assured security. This means the ability to have more control of the solution as well as to offer the complete solution in a controlled environment, but without the need to provide any actual hardware.^{xx}

3. Impact on project and investment management in IT

The economical as well as the technological changes and their even increasing change frequency need to be integrated in new concepts of IT investment management. The system of cybernetics offers ways of looking at investment management which start with the acceptance of embeddeness as part of contextual complexity. Together with further multiple perceptions it tries to define and handle environmental influences and system components to the benefit of the investment. This is a view of investments as political issues on the organizational agenda rather than as closed-in activities construed out of corporate goals, it means that these issues need to be piloted through the whole organization while satisfying all relevant stakeholders.

It means furthermore to deal with investment management 4.0. Thus it is necessary to be aware about components within and without the business unit which the investment is aimed for.

Finally the basic reasons are dealing with the Basic- and Meta-values, the philosophy of live and living as well as the belief and conviction of the individual and the organization.

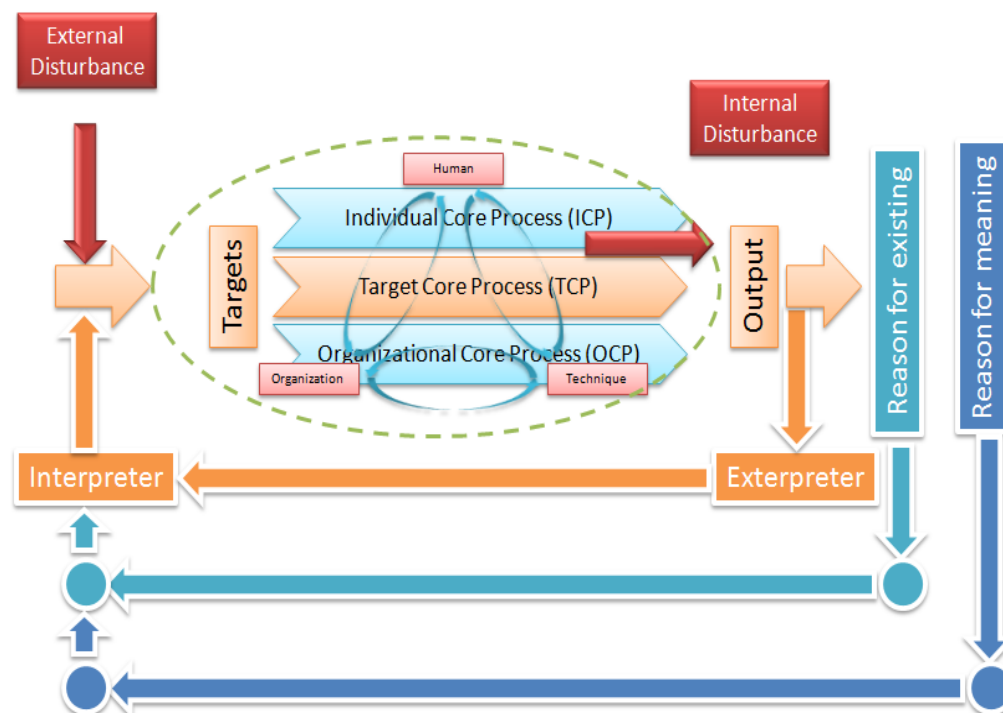


Figure 2: Complex cybernetic investment management framework

Following this system approach, it means to manage the whole context of a project: to deal with all components of the system including the acceptance of targets and long-term aims, and to ensure the delivery of the output according to the Mission Statements. In particular, the Reasons for Existence of the system are to be coined as the Business Objectives, they are distilled from the Business Needs in an iterative and continuous process: Thus the continuing existence of the system and the accuracy of defining the Business Needs and Objectives are managed. Additionally they provide assets as the input will be balanced with the value of the objectives through feedback loops (blue color).

On the operational level, management means the alignment of the customer's expectations of output with the Objectives and its translation into business targets. Thus the organization as a system will reach the expected fulfilment of the objectives (orange color).

Furthermore there is the management of disturbances (Risks). It needs to be done with the resources available, within the timing and the scope of the Target Core Processes which are part of the tactical level of project management (Red color).

The system components are interacting within the system as well as the system is interacting with the environment^{xxiv} as mentioned before. There is the need of stability and orientation within investment management. This orientation can only be given on a vision level through the statement of the system Meaning. Long-term survival of the business as this cybernetic system is dependent on having defined sustainable and future-oriented Meaning statements. The focus here is on the system usefulness in terms of sustainability, e.g. in the context of individual, cultural, ethical questions and expectations within society.

These Meaning statements imply that there are values defined for the owner of the investment. Values are one dimension for measurement of effectiveness. Here we consider efficiency versus effectiveness: Efficiency is measured as productivity metric, and effectiveness is assessed by quality metric^{xxv}. Being efficient means to spend less time, less money or less effort (or number of workers) on some output. This was the main aim in investment management of the traditional style. Being effective means to do the job according to the expected quality^{xxvi}. Quality of output in this perspective means that the products or services have to be valuable for the customer which means that they contribute to the customer's values.

Beyond the original OSTO model, two new roles are introduced in the system model as described here. The first role is the Interpreter. It means here that the interpreter has the responsibility to understand certain orders (e.g. management decisions) and translate them into actions. The interpreter has to be a part of the system to ensure that the necessary actions are taken. Some references describe the interpreter as mirror within the system to allow the system to change according to new challenges^{xxvii}.

The role of interpreter is necessary as the steering injection into the system based on feedback information. Thus the second role is the Exterpreter. As the interpreter injects signals into the system, the exterpeter extracts information from the system and its output, and changes this information into a certain language to allow closing the cybernetic loop^{xxviii} toward the interpreter.

Taking this system view into account, it means dealing with the challenges within IT in a specific way: even working in an agile business includes to focus on benefit and value creation on mid- and long-term, beyond mere short-term decisions. Some investors define objectives for risk (like KRI) and performance (like KPI) by using portfolios of investments and managing these projects based on these figures. Others use IT portfolio management to enable their management teams to align IT investments with strategic objectives.^{xxix} Others are using Cost-Benefit Analysis in retro-perspective for IT investments.^{xxx}

As IT investment is changing towards agile delivery also business will change to more agility. Iterative delivery of products in B2B and B2C will allow to create value and earn benefits from the early beginning. Therefore, as mentioned above, modifications to the traditional decision criteria – mainly economically and technically focused – are necessary to value creation and services delivery. The current emphasis on how, why, when and for whom investment

management systems as stated with INV 1.5 are not suitable in this perspective^{xxxi}. Comparing with the Agile Manifesto^{xxxii} the actual way of working should be modified. Especially the human side of IT development need to be changed. The today approach is using a bottom-up methodology to address a wider set of benefits and risks while creating the greatest benefit for consumers and society. This can be even improved by incorporating communal and societal criteria and promoting growth. These aspects are wider than the pure economical reason for existing. IT investments may contribute with partial future proved solution to resolve many of the problems faced today with taking care about our durability and not trying to solve the possible problems of tomorrow^{xxxiii}.

4. Handling the complexity

As it is not easy to track benefit and improved value during the execution of the project the agile delivery allows to get more insight. While a selected group of trustable customers or users are in touch with the first shippable product a clear and open feedback allows to estimate the available value and benefit^{xxxiv}. As we take care about all aspect in the cybernetic system we know also about the humans in our IT investment system. Using this first iteration with feedback of the user group the customer can decide either to penetrate the market with the first shippable product or not and go into a next iteration.

By that we see that the first and most important component of our system is the human. He is the one who delivers as a part of the team as well as the one who will use the deliverables later on. This extension to the original OSTO approach follows the agile trends. ^{xxxv} If we can organize a user group to execute reality tests we will get additional non-monetary value on top. This user group will take over the role of “Extrepreter”, extracting the delivered value from the system end analyze them. Also the results of this exterpertation the user group will also deliver input to the system as interpreter. Rather, the people who are starting in a certain role in the IT project (such as a specific web development platform) will often have different talents, preferences, and attitudes than others. Over time, bringing both together and let them work contemporary will also make them develop different skills and reinforce attitudes and existing behavioural differences.^{xxxvi} A customer become thinking as a developer and a developer starts thinking as customer. The user group becomes part of the team and the exterpertation and interpretation tasks are assimilated^{xxxvii}. This leads directly to a second validation and steering loop with the reason of meaning while the reason of existing is the loop with the traditional (legacy) project management based on the business case.

Beside user groups integrated into the system a continuously challenge of the contribution to the benefits and value is necessary. Therefore a X-reference is necessary to identify the contribution to the strategic drivers (taking care about the investment management model INV. 1.5) as well as the values and customer expectations are necessary. It is not only necessary to do things right but also doing the right things^{xxxviii}. This principle of the investment management model INV 1.5 should also be adopted to the reason of meaning. Each potential shippable product have to fulfil also these indicators. As these indicators are more stable and combined with an agile business approach allows the customer to deliver as much as needed and as less as possible solutions^{xxxix}.

These X-references need to be made on different levels. Not only the fact that there is a link between customer’s expected out-come and the value and benefit but also the intensity of the link is relevant^{xl}. The X-Ref have to be developed both for the link between the stakeholders (incl. user group) and the values as well as the link between the value and the customer’s expected out-come. This will allow the project manager to support the selection of the deliverable items of the iterations to create the customer’s expected out-come. A wide spread set of visualisations is available to present the results of these X-references^{xli}. Practical research shows that these visualisations are necessary for the success of the project^{xlii}.

Finally the project management within IT need to deal with the principle of loosely coupling of business and IT. Using this principle the business process is loosely couplet with IT processes and by that with IT investment processes. Each potential shippable product have to be usable.

The user group agrees on it and the business process can be implemented to let the delivered product work. This way of working can be compared with an practically implementation of the dual design^{xliii}. Here the delivery starts with two extreme alternatives. One alternative could be a full automate steering the other one is the manual operator. Starting with the manual operations the business is already able to earn value by knowing the process and using by example paper based information processing. The first step in adding value is by that knowing the process and implementing this (as a pilot) in the user group. After this first feedback and adaptation the potential customer's expected out-come can be used in the market. By that a fast value creation is guarantied. All the other iterations will deliver more and more automation and allow a wider market penetration with as less as possible manual work. This way of working request the necessary trust between all involved parties and the conviction that more automation will be delivered in the next iteration^{xliv}.

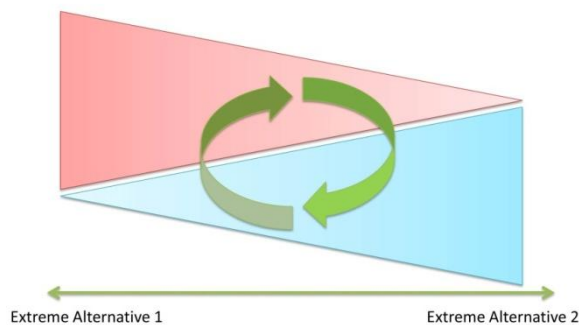


Figure 3: The dual design

Evaluate all alternatives on their impact on the objectives and values will allow you to take the necessary decisions. If they have a positive impact than the change should be considered as positive. If not, than the investment can be stopped or changed with as less as possible lost effort. This leads to an agile Program Management Approach^{xlv}.

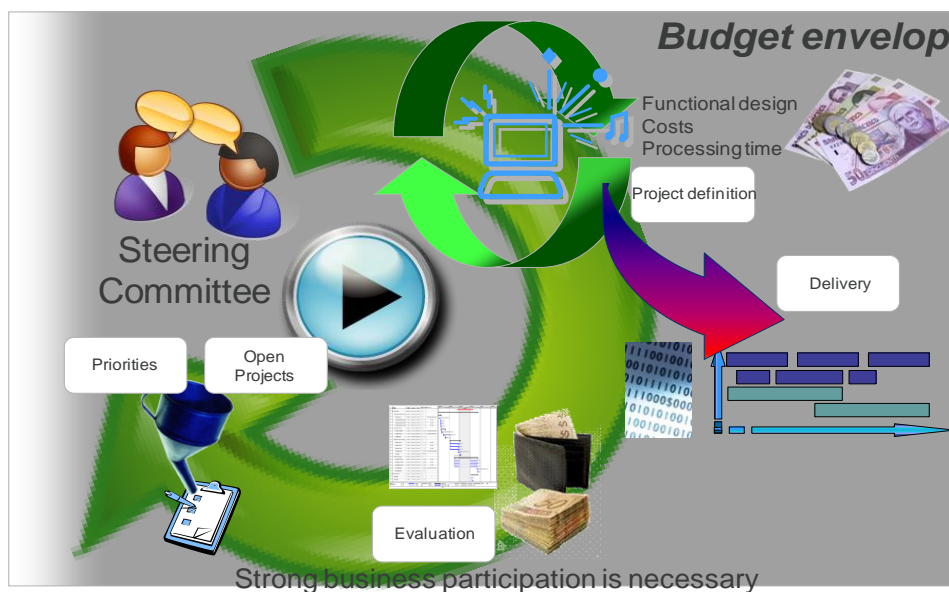


Figure 4: Agile program management approach with stabilized delivery

5. Case

Executing IT projects within the financial industry beside the above named constrains additional regulations are valid. This leads to the fact that a lot of market entry points are missed due to complexity management. These market entry points are specific moments in time (like fairs,

events, change of regulations, etc.) which are fixed externally. Unfortunately the time between facing this point and optimal market entry point is relatively short. A full blown IT project dealing with all aspects valid for IT in financial industries will lead to a delay or extend the costs unacceptable.

During a case the revamping of the automation of a back-office should be done. The task of this back-office was fundraising and grand management. The actual system was build in End-user tooling (Access) and run out of support and, on top of this, did not fulfil legal requirements. During the years the implementation was extended, reduced or changed that way that nobody actually know the functional and technical design. The integration of these applications with the core data system of the financial institution was also organically grown.

As this entity wasn't able to execute their tasks supported by the tool the pressure on the project increased dramatically. Together with the (senior) general management we decided to apply an agile business approach. In the first iteration we designed a business process As Is. Together with the customer we decided to implement a iterative business implementation based on a pre-defined value system where the traditional project management aspects (budget and timing) are in the minority. As one of the most important value the X-reference between value and cost per customer's expected out-come.

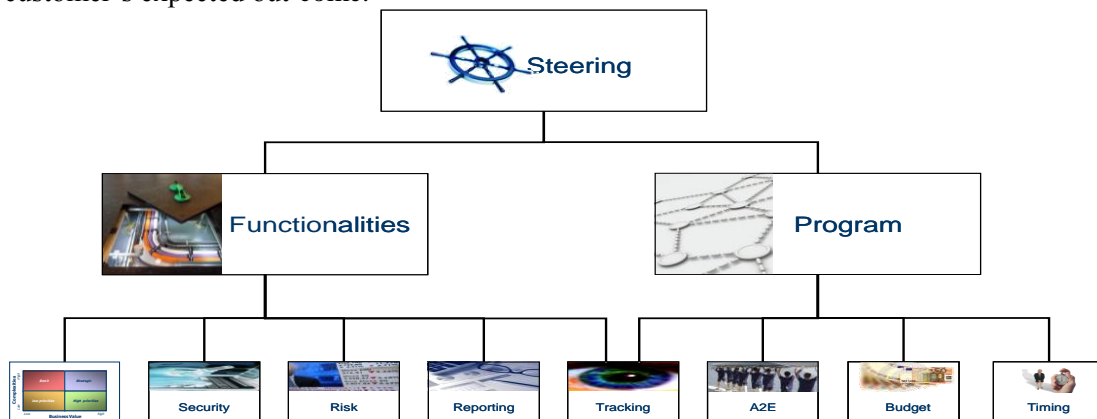


Figure 5: The used value system to evaluate the customer's expected out-come

The first iteration was based on a temporary export of data processed in a created Excel file. After each week a manual process was executed to import the data again to the core banking system. Using this first almost manual business process allowed the customer to continue with the business. The link between business process and IT process was loosely coupled.

In the second iteration we executed a RFI/RFP where we request external vendors as well as internal ICT department to apply. The "build or buy" decision was fully integrated into the RFP-procedure. Based on trust IT and the customer selected a package with tailored interfacing to the core banking system.

The third iteration was the implementation of the package for the back-end and integrate this with the core banking system. The build-in processes are implemented which leads to changes to the actual business processes. In this case the adaptation of the business process towards the presented processes of the package was more efficient and effective than changing the package. After the implementation on a test environment customer and IT developed in weekly iterations together with the user group the screens, workflows and documentations in parallel. After a period of 4 weeks parallel use of the pilot (package) and the manual process the user group ask for a full roll-out.

The fourth iterations then extend the back-office package with the web portal of the customer. And extend the functionality of the interfaces with the core banking system. The web portal allows the broker on the field to access partly data of the package without contacting the back-office. This increased the benefits and fulfils the need of more autonomy of the employees in the field.

The fifth iteration then provided the full integration with the bank-branch system. As this system is under control of regulators these changes have to be developed according to specific regulations.

This case shows that the combination of an agile business approach with loosely coupled business and IT processes in combination with trust and an empowered user group enables a delivery 6 months earlier (instead of 24 months we delivered in 18 months) and with almost 18% less than the foreseen budget. The users themselves decided the delivered features and got more insight into the processes both on business and IT. The delivered customer's expected outcome fits almost 93% to the expectations and until today (4 years later) the cooperation between IT and customer still allows an effective delivery during maintenance.

The opposite is that the expected effort and flexibility of both customer and IT resources was increased. Also a certain level of maturity and tolerance was necessary to work in the user group. Some members still believed that the "over the fence" method would have delivered more valuable outcome, at least on short term.

6. Results and Conclusion

Project Management is growing through the years. The historical discussion shows that the gap between the agility of the market with their customers continuously grows. For IT the additional challenge of the rapidly changing technology is a surplus on the gap.

Using a system-cybernetic approach for project management shows that the traditional business case based steering is not sufficient. To be able to follow the markets there is a need for different adaptation on the project management in IT.

The first change is to integrate as soon as possible all parties in a user group. Even customers or users should be integrated from the early beginning. Only they can assume the acceptance of any solution. As the market is rapidly changing there is no second chance once the user and customers are lost.

The second adaptation is to keep the traditional KPIs in mind but focus on values and meanings. These values and meanings are more stable and allow the investor to create an identification. Of course each investment should still fulfil basic economical rules like having a positive Business Case.

The third adaptation is to cooperate agile on both sides on business as well as on IT. There are in a lot of cases no need of a full blown implementation for a first market entry. By that IT is always coming on the second place after creating value.

To be able to execute projects with these changes trust between IT and business must become granted and both parties need to keep the targeted value in mind. Finally a loosely coupling of business and IT is necessary. By that the business process can change without direct impact on IT processes and by that with IT investment processes.

A case in the financial industry shows that the above named prerequisites in combination with an agile business approach with loosely coupled business and IT processes together with trust shows significant results. A delivery 6 months earlier (instead of 24 months we delivered in 18 months) and with almost 18% less than the foreseen budget and a fit of almost 93% of the expectations is the measurable result. On top the exchange of knowledge and more insights of the other groups are also given facts.

7. Acknowledgements

I am highly indebted to Dr. Dietrich Brandt, former Chairman of the Committee on Social Impact of Automation within the International Federation of Automatic Control (IFAC), for his guidance and constant supervision as well as for providing necessary information regarding this article.

8. About the author

Frank Stumpe was born in Germany 1969. After a vocational training as mechanical he studied mechanical engineering at the RWTH University of Technology Aachen, Germany. He finished his Ph.D. in project management in complex-cybernetic systems. In parallel he works as consultant in project- and change management at Trox Ventilation, John Deere, ÖBB, SBB, Holcim, etc. Frank Stumpe was lecturer at the RWTH Aachen for Project Management and

holds actually guest lecturers at the University of Münster, the KU Leuven as well as the K.H.Kempen University College. He is active as promoter of master thesis's and PhD. students. As moderator of an international discussion group about Project and Program Management within ICT he actual share his knowledge.

The professional career of Frank Stumpe was international and crossindustrial. Starting from managing European research projects he works for heavy industry, food industry as well as hotels and transport. He was CEO of IPS Bulgaria Ltd. and member of the Group-ExCo responsible for training and methods. Today working as head of the competence centre project based working at KBC Group. He has app. 17 years' experience in all facets of project management.

9. References

-
- ⁱ Mark Kozak-Holland, The History of Investment Management, PM World Today – July 2011 (Vol. XIII, Issue VII), ISBN: 13:9781554890965, 2011
 - ⁱⁱ Fullerton, Ronald A. (January 1988). "How Modern Is Modern Marketing? Marketing's Evolution and the Myth of the "Production Era"". The Journal of Marketing (New York City, NY: American Marketing Association) 52 (1): 108–125. doi:10.2307/1251689. JSTOR 1251689.
 - ⁱⁱⁱ Peter W. G. Morris, Jeffrey K. Pinto, Jonas Söderlund, The Oxford Handbook of Investment Management, ISBN 978-0-19-956314-2, 2010
 - ^{iv} Moore, Gordon E. (1965). "Cramming more components onto integrated circuits" . Electronics Magazine. p. 4. Retrieved 2006-11-11.
 - ^v Kurzweil, Ray (2005). The Singularity is Near. Penguin Books. ISBN 0-670-03384-7.
 - ^{vi} Karl Aiginger, Speed of Change and Growth of Manufacturing, Structural Change and Economic Growth; Reconsidering the Austrian "Old-Structures/High-Performance" Paradox, Austrian Institute of Economic Research (WIFO), 2005
 - ^{vii} OGC (Office of Government Commerce) (2009). Managing Successful Investments with PRINCE2 (2009 ed.). TSO (The Stationery Office). ISBN 978-0-11-331059-3.
 - ^{viii} De Haes, Steven, KPMG seminar 2013, Antwerp
 - ^{ix} Scharmer, Otto, Seven Acupuncture Points for Shifting Capitalism to Create a Regenerative Ecosystem Economy, Oxford Leadership, Journal, shifting the trajectory of civilization, June 2010 • Volume 1, Issue 3
 - ^x Weiss & Wysocky, 5-Phase Project Management, Sustainable Project Management, 2005
 - ^{xi} Osterwalder, A., & Pigneur, Y., Business Model Generation. New Jersey, John Wiley & Sons, Inc., 2010
 - ^{xii} Stumpe, Frank, Course Project Management in practice, Summary of model, course and scientific excursion, ISBN 9783839114803
 - ^{xiii} IDC information worker custom survey, business IT custom survey, sponsored by Unisys, 2011
 - ^{xiv} Avanade® Research & Insights, Global Survey: Consumerization of IT, 2012
 - ^{xv} The consumerization of IT, The next-generation CIO, pwc, Center for Technology and Innovation, 2011
 - ^{xvi} Gartner Identifies the Top 10 Strategic Technology Trends for 2013, Gartner Symposium/ITxpo, 2012
 - ^{xvii} Covering the intersection of tech and investing, Eric Savitz, Forbes Staff, 2012
 - ^{xviii} The Internet of Things, A critique of ambient technology and the all-seeing network of RFID, Rob van Kranenburg, 2007
 - ^{xix} Managing hybrid IT, Searching for the right blend of desktop and cloud, David Howell, 2013
 - ^{xx} IT ecosystems: A new paradigm for engineering complex adaptive software systems, Rausch, A., Digital Ecosystems Technologies (DEST), 2012 6th IEEE International Conference, 2012
 - ^{xxi} Staffan Johansson, Mikael Löfström, Östen Ohlsson, Göteborg University, Separation or integration? A dilemma when organizing development projects, 2007
 - ^{xxii} H. E. Krug In: K. Henning und B. Harendt (Hrsg.): Methodik und Praxis der Komplexitätsbewältigung Diagnose und Design komplexer Organisationen OSTO Systemmodell, . 1992
 - ^{xxiii} Project Management: A Systems Approach to Planning, Scheduling, and Controlling, Harold R. Kerzner, 2013

-
- ^{xxiv} Frederic Vester, Die Kunst venetzt zu denken - Ideen und Werkzeuge für einen neuen Umgang mit Komplexität, dtv, München; ISBN 978-3-423-33077-0, 2002
- ^{xxv} Petzold, Stephan: Einführung der Balanced Scorecard als Performance-Meß-System für systemische Organisationsentwicklungsprozesse. Unternehmenskybernetik in der Praxis, Band 4: Shaker, 2001
- ^{xxvi} PURVA VERMA, Dr. Rao, EFFICIENCY VS. EFFECTIVENESS, 2013
- ^{xxvii} Brandt, Dietrich: Human-Centred System Design - First: People, Second; Organization, Third: Technology. 20 Case Reports. Aachener Reihe Mensch und Technik, Band 42. Aachen: Wissenschaftsverlag Mainz, 2003
- ^{xxviii} Stumpe, Frank, Project Management in practice, 2013
- ^{xxix} Generating Premium Returns on Your IT Investments, Peter Weill and Sinan Aral, 2006
- ^{xxx} Vaughan, J., Leming, M., Liu, M., and Jaselskis, E. (2013). "Cost-Benefit Analysis of Construction Information Management System Implementation: Case Study." J. Constr. Eng. Manage., 139(4), 445–455.
- ^{xxxi} Using Agile to Create Economic Value for Society, Cohen, Stephen Money, William H., System Sciences (HICSS), 2013 46th Hawaii International Conference, 2013
- ^{xxxii} Manifesto for Agile Software Development, <http://agilemanifesto.org/>, 2001
- ^{xxxiii} ICT en duurzaamheid, IT Management Group, 2012
- ^{xxxiv} Agile Practices to Accelerate the Delivery of Software: A Quantitative Study with Software Professionals, HICSS 2013: 4771-4779, university of Trier, 2013
- ^{xxxv} The Software Requirement Development of Information System, Xianyu Li Hua Wang Xiaokun Li Huijun Zuo and Shan Wang, Proceedings of the 2nd International Conference on Computer Science and Electronics Engineering (ICCSEE 2013)
- ^{xxxvi} Plat Forms: Contests as an Alternative Approach to SE Empirical Studies in Industry, Lutz Prechelt, Ulrich Stärk, Proc. 1st International Workshop on Conducting Empirical Studies in Industry (CESI), San Francisco, May 2013, published on homepage Freie Universiteit Berlin, 2013
- ^{xxxvii} Configural and pictorial Displays, Kevin B. Bennett, John M Flach in The Oxford Handbook of Cognitive Engineering geredigeerd door John D. Lee, Alex Kirlik. 2013
- ^{xxxviii} Project Portfolio Management – White paper, Microsoft, Published: August, 2008
- ^{xxxix} The role of BPM in the IT value-chain: Exploring how managing business processes and decouple business and IT, Charles Moller, in Advances in Enterprise Information Systems II, Charles Møller, Sohail S. Chaudhry, 2012
- ^{xl} Sensitivitätsanalyse des strategischen Projektmanagements im Gesundheitsbereich, von Hannes Moser, 2003
- ^{xli} Cool Features and Tough Decisions: A Comparison of Variability Modeling Approaches, Krzysztof Czarnecki et al, 2012
- ^{xlii} A case study on variability management in software product lines: identifying why real-life projects fail, Huysegoms, T ; Stumpe F. et al., International Journal of Information Systems and Project Management, Vol. 1, No. 1, 2013, 37-48
- ^{xliii} Diagnose und Design komplexer Organisationen OSTO Systemmodell, H. E. Krug In: K. Henning und B. Harendt (Hrsg.): Methodik und Praxis der Komplexitätsbewältigung, 1992
- ^{xliv} Significance of trust in reputation building mechanisms, Radoslav Delina, Fraticsek Janke & Michal Ticee, in in Advances in Enterprise Information Systems II, Charles Møller, Sohail S. Chaudhry, 2012
- ^{xlv} ICT Program and Project Management in financial Industries - General conditions and methods, Lecture at Department of Information Systems (IS) at the University of Münster, Stumpe F., 2010